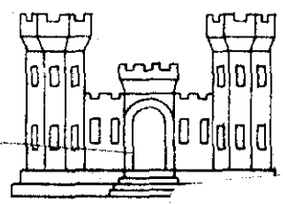
~~CONFIDENTIAL~~

SURVEY (REVIEW OF REPORTS) OF

DANVERS RIVER

MASSACHUSETTS



FILE COPY

AUTHORITY,- THIS REPORT IS SUBMITTED IN COMPLIANCE WITH RESOLUTION, ADOPTED APRIL 13, 1939 BY THE COMMITTEE ON RIVERS AND HARBORS OF THE HOUSE OF REPRESENTATIVES UNITED STATES.

U. S. ENGINEER OFFICE,
BOSTON, MASS.
FEBRUARY 1, 1941.

COPY NO. 17

SURVEY (REVIEW OF REPORTS) OF DANVERS RIVER, MASS.

Syllabus

The district engineer is of the opinion that a channel in the Danvers River 100 feet wide and 12 feet deep at mean low water, extending from the head of Beverly Harbor to the Water Street Bridge over Waters River, with a turning basin at its head, would adequately meet the present or any reasonably prospective needs of commerce. He believes, however, that the resulting benefits would not be sufficiently general in character to warrant the United States in undertaking the improvement unless local interests would contribute one-third of the initial cost, and provide a berth 50 feet wide and at least 12 feet deep at mean low water alongside the oil terminal on Waters River. Since it has been impossible to obtain assurances from local interests, with the exception of the Massachusetts Department of Public Works, that they would contribute toward the required sum, the district engineer recommends that no project for the improvement of Danvers River, Massachusetts, be adopted by the United States at the present time.

War Department
United States Engineer Office
Boston, Mass.
February 1, 1941

Subject: Survey (Review of Reports) of Danvers River, Mass.

To: The Chief of Engineers, U. S. Army, through the Division Engineer, North Atlantic Division

1. Authority.- Authority for this report is contained in the following resolution adopted April 13, 1939, by the Committee on Rivers and Harbors of the House of Representatives, United States Congress:

> RESOLVED BY THE COMMITTEE ON RIVERS AND HARBORS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES, That the Board of Engineers for Rivers and Harbors created under section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the reports on Danvers River, Massachusetts, submitted March 15, 1928, and June 11, 1932, with a view to determining if any improvement of this river is advisable at the present time.

2. A preliminary examination report (review of reports) as required by law was submitted by the district engineer January 17, 1940. The report, which was favorable, was concurred in by the division engineer and the Board of Engineers for Rivers and Harbors, and a survey to determine the advisability and cost of improvement, with recommendations as to local cooperation, was authorized by letter from the Chief of Engineers dated February 16, 1940.

3. Reports under review.- Of the two reports under review, the first was concerned with a preliminary examination of Danvers River, authorized by an item in the River and Harbor Act of January 21, 1927, and dealt with improvement of Danvers River to provide a channel 60 feet wide and 8 feet deep at mean low water. In his report dated December 14, 1927, the district engineer concluded that the prospective commerce would be too small in amount and too local in character to warrant improvement of the river by the Federal Government, and he recommended that no survey of the locality be made. The division engineer, the Board of Engineers for Rivers and Harbors and the Chief of Engineers concurred in these unfavorable views.

4. The other report under review was authorized by a resolution adopted January 7, 1932, by the Committee on Rivers and Harbors of the House of Representatives, requesting a review of the report discussed above. In his review report, dated March 9, 1932, the district engineer expressed the opinion that further consideration of the 12-foot channel desired by local interests was apparently warranted by the revival in water-borne commerce which had taken place in Danvers River since submission of the previous unfavorable report, and recommended that a survey of the locality be made. These favorable views, however, were not concurred in by the division engineer, the Board of Engineers for Rivers and Harbors and the Chief of Engineers, and a survey was not authorized.

5. Description.- The Danvers River, also known as Essex Branch, is a short, tidal stream which drains an area of approximately 1¼ square miles lying entirely in Essex County, Massachusetts. Formed by the confluence of the Porter and Crane Rivers, at the town of Danvers, the stream follows a general southeasterly course a distance of about 2.2 miles to the head of Beverly Harbor, which also receives the waters of Beverly Creek (Bass River) and North River at this point. Waters River, the principal tributary stream, enters the Danvers River about 1/4 mile downstream from the junction of Crane and Porter Rivers.

6. Danvers River is approached from the sea through the Federally

improved channel in Beverly Harbor which has a depth of 24 feet at mean low water. Within the river the channel is generally crooked and of variable width and depth. Except in the draw passage of the second bridge above the mouth of the river, where the depth is 10 feet, this channel has a controlling depth at mean low water of 12 feet and width of 100 feet for 1.4 miles above the mouth, and a depth of 6 feet and width of 75 feet for the remaining 0.8 mile to the confluence of the Porter and Crane Rivers. Continuing into Porter River there is a narrow, crooked channel, with a controlling depth of 1.6 feet at mean low water, extending for about 3,200 feet to the Calvin Putnam Lumber Company just below the Liberty Street Bridge. The channel in Waters River has a controlling depth of 6 feet and width of 40 feet and extends to the wharf of the two oil companies located about 1,200 feet upstream of its mouth.

7. The mean range of tide in Beverly Harbor, at the mouth of Danvers River, is 9.0 feet and the spring range 10.4 feet. The locality is shown on United States Coast and Geodetic Survey Chart No. 240, and on the map accompanying this report.

8. No project for the improvement of Danvers River has ever been adopted by the Federal Government, nor is any channel improvement known to have been made in this locality by State or local interests. No questions of water power, flood control, or other special subjects are involved, and it is believed that the improvement of Danvers River would have no marked effect on shore lines along the river or in Beverly Harbor.

9. Tributary area.- The locality primarily concerned with the improvement of Danvers River is the town of Danvers, Massachusetts. In 1935 the population of Danvers was 13,884 and the assessed valuation of its real estate as of January 1, 1939, was $11,741,750. In addition to serving as a residential suburb for the larger cities of Boston and Salem, Danvers is a manufacturing center of considerable importance, having industries engaged in the manufacture of chemicals, enamels, shoes and other leather goods, paper boxes, and other products. In 1937 there were 20 manufacturing plants

located in Danvers employing over 1,000 persons, the products of which were valued at $4,147,150. The locality is served by the Boston & Maine Railroad, by 4 state highways, and by other improved roads, all of which combine to provide excellent transportation facilities to neighboring cities. Within a radius of 10 miles of Danvers are located some 23 cities and towns having an aggregate population in excess of 300,000. The largest of these are Lynn, Salem and Beverly, all of which are located on tidewater and have fairly well-developed harbor facilities. Danvers is favorably situated as a distributing center to the sections of Massachusetts and New Hampshire located to the north and northeast and, according to statements made by local interests, now serves many communities located in that area.

10. Bridges and other structures.- There are 3 bridges which come within the scope of this report, all of which cross the Danvers River within one mile of the mouth. The desired improvement would necessitate no alterations to these structures, all of which were built under plans approved by the War Department. Data relative to these bridges are tabulated below:

Miles above mouth	Owner	Type	Channel Spans			Use
			Horizontal clearance	Vertical clearance M.L.W.	Vertical clearance M.H.W.	
0.00	Essex County Commissioners	Swing	40.5 ft.	19.3 ft.	10.3 ft.	Highway
0.06	Boston & Maine Railroad	do.	40.0 ft.	12.8 ft.	3.8 ft.	Railroad
1.00	Essex County Commissioners	do.	50.0 ft.	17.15 ft.	8.15 ft.	Highway

11. In addition to the bridges, the Danvers River is crossed by a 36-inch cast-iron pipe, about 8,000 feet upstream of the mouth. This pipe line was authorized by a Federal permit to the city of Salem, Mass., dated October 18, 1915. Where it crosses the channel, the top of the pipe is 16.5 feet below mean low water, or 4.5 feet below the desired depth in the channel. Crossing the Porter River, at its mouth, is a 24-inch outfall sewer and a submarine power cable. The sewer was authorized by Federal permit

to the South Essex Sewerage District, Salem, Mass., dated September 15, 1926, and the submarine cable by Federal permit to the Electric Light Department of Danvers, Mass., dated October 11, 1923. The top of the sewer where it crosses the channel is 12.5 feet below mean low water; and the submarine cable is laid on the bottom. The desired improvement would not affect the 36-inch water pipe, but would necessitate the lowering of the 24-inch sewer. The cost of lowering this sewer, which would have to be borne by the South Essex Sewerage District, is estimated at $16,000. This office has been advised that the submarine cable would be removed in the event of dredging in that locality.

12. Prior reports.- The only reports of the War Department on Danvers River and its tributaries, in addition to the reports under review, are those on preliminary examination and survey of Crane and Waters River of Essex Branch (Danvers River), made in compliance with an item contained in the River and Harbor Act of August 11, 1888. These reports, dated November 1, 1888, and December 2, 1889, are printed in H. Ex. Doc. No. 23, 51st Congress, 1st session. The district engineer in his report on preliminary examination of these two streams recommended a survey of the locality for the purpose of providing a channel 8 feet deep at mean low water from Beverly to Danversport. In his survey report the district engineer submitted estimates of cost of a channel in Waters River 100 feet wide and 8 feet deep at mean low water, extending 2,600 feet upstream from deep water in Essex Branch; and of a channel in Crane River 100 feet wide and 8 feet deep at mean low water, extending 2,350 feet upstream from deep water in Essex Branch, including the dredging to the same depth of a small shoal spot in Essex Branch just below the mouth of Crane River. This report contained no recommendation and no action on the project was taken by Congress.

13. Terminal and transfer facilities.- There are no terminal facilities on the Danvers River proper, but on Waters and Porter Rivers 3 wharves are available. The wharf of the Calvin Putnam Lumber Company, located on the south bank of Porter River just below the Liberty Street Bridge, con-

sists of a solid fill retained by a timber bulkhead. This wharf has a berthing space of 335 feet fronting on the river, with an average depth of about 1 foot at mean low water. About 85 feet of this space is used for docking purposes. No mechanical appliances are available at this wharf, which is accessible by highway but has no rail connection.

14. Also on the south bank of Porter River, about 3/8 mile below the Liberty Street Bridge, is a wharf owned by the Danvers Coal Company. This structure, which consists of a solid fill retained by a timber bulkhead with a pile extension, provides a docking length of about 125 feet with a depth of 4 feet at mean low water. This wharf, which is accessible by highway, was formerly used for receiving coal, but during the past 10 years has been idle except for occasional use by small fishing vessels. Storage facilities for oil, consisting of two small tanks of 10,000 gallons' capacity each, are located on this property, but are not used at the present time.

15. A third wharf, situated on the north bank of Waters River just below Water Street Bridge, is owned by Mr. Harry C. Rix of Danvers and used by the White Fuel Corporation, the Leader Filling Stations Corporation, and the Stearns Marine Company. This wharf is of the marginal type and consists of a solid fill retained by a timber bulkhead, with a pile extension. It has rail and highway connections, and is equipped with pumps and pipe lines for handling petroleum products to and from the storage tanks. The entire length of the wharf of 140 feet is available for berthing, with depths ranging from 4 to 9 feet at mean low water. The tonnage of petroleum products received by the oil companies, which have a combined storage capacity of about 5,500,000 gallons, represents practically the entire commerce of Danvers River. At the lower end of this wharf the Stearns Marine Company has a storage and repair plant which is equipped with a marine railway for handling motor boats up to 40 feet in length.

16. The existing oil terminal facilities are considered adequate for the present or any reasonably prospective water traffic. Much of the waterfront is undeveloped and affords possible sites for future terminal expansion, if needed.

17. Improvement desired.- In order to afford local interests an opportunity to express their views relative to the improvement of Danvers River, a public hearing was held at Danvers, Massachusetts, on October 3, 1939. The report on preliminary examination, together with transcript of hearing, exhibits presented, map, and other pertinent papers, was submitted to the division engineer January 17, 1940. Among those present at the hearing were national and state legislators, representatives of the town government, civic organizations, transportation and industrial interests, the Massachusetts Department of Public Works, the Maritime Association of the Boston Chamber of Commerce, and interested individuals.

18. The improvement which was generally favored at the public hearing provided for the dredging of 2 connecting channels, one with a width of 100 feet and depth of 15 feet at mean low water, to extend from the head of Beverly Harbor to the Water Street Bridge over Waters River; the other with a width of 80 feet and depth of 11 feet at mean low water, to extend from opposite the entrance to Waters River to the Liberty Street Bridge over Porter River. A turning basin at the head of each of these channels was specifically requested.

19. Danvers was characterized as a natural distributing center for the many communities in Massachusetts and New Hampshire located north of the town. Proponents cited the growth in waterborne commerce received at Danvers, from an annual average of about 3,400 tons in the 10 years prior to 1928, to upwards of 70,000 tons at the present time. Particular stress was placed on the importance of petroleum products in this revival in traffic. It was stated that present facilities for the storage of petroleum products total about 5,500,000 gallons and that existing permits, not now fully utilized, will permit an aggregate storage of nearly 20,000,000 gallons. It was claimed that a number of major oil concerns, as well as several other industries, have shown a desire to locate at Danvers, but on account of unsatisfactory channel conditions abandoned the idea. Proponents expressed the belief that lumber and coal interests, fishing and pleasure

boats would also make extensive use of an improved waterway. Among the general benefits claimed for the desired improvement are increased tax revenues, enhanced land values, additional employment, and stimulation of general development in Danvers and the communities it serves.

20. Existing navigation conditions were described as inefficient and generally unsatisfactory, chiefly because the limited depths frequently result in groundings and constantly involve expensive delays to vessels waiting for favorable tides. The improvement desired, it is claimed, will correct these conditions, permit the use of fully loaded vessels and result in more dependable and cheaper water transportation. It is also expected to result in a large increase in waterborne tonnage and encourage expansion of the Danvers waterfront.

21. Subsequent to the public hearing, this office received letters from the Leader Filling Stations Corporation and the White Fuel Corporation, dated October 18 and 19, 1940, respectively, indicating that a 12-foot depth to their wharf on Waters River would meet all requirements and result in benefits substantially the same as those from the 15-foot depth previously requested. This change in the depth would obviate the costly lowering by the city of Salem of the 36-inch water main which crosses the Danvers River about one-third of a mile downstream from the mouth of Waters River. Based on the above communications and recent interviews, the improvement now desired by local interests is as follows:

a. A channel 100 feet wide and 12 feet deep at mean low water, extending from deep water at the head of Beverly Harbor to the Water Street Bridge over Waters River, together with a turning basin at its inner end, as shown on the accompanying map.

b. A channel 80 feet wide and 11 feet deep at mean low water, extending from the 12-foot channel opposite the mouth of Waters River upstream to the Liberty Street Bridge over Porter River, together with a turning basin at its inner end, as shown on the accompanying map.

22. There was no specific offer of a contribution toward the cost of the desired improvement at the public hearing. A recent canvass by this office in regard to a contribution by local interests toward the initial cost of the modified improvement outlined in paragraph 31 a. revealed that the Division of Waterways of the Department of Public Works, Commonwealth of Massachusetts, viewed such a project favorably and would support legislation by the state to furnish one-half of the sum of any recommended contribution, provided others interested would contribute the balance. Among the local interests interviewed were the officials of the town of Danvers and the two oil companies which would be the principal beneficiaries of the improvement, but no commitment could be obtained for any part of the balance.

23. The following tables give a comparative statement of the traffic on Danvers River for the 10-year period 1930 to 1939, inclusive, and that for 1939 in detail.

Comparative statement of traffic

Year	Tons	Year	Tons
1930	15,524	1935	50,408
1931	24,941	1936	42,886
1932	39,173	1937	33,440
1933	39,083	1938	47,251
1934	42,600	1939	71,150

Freight traffic, 1939

Foreign

Imports	Tons
Wood and paper: Lumber	150

Domestic

Coastwise receipts

Non-metallic minerals:	
Gasoline	7,374
Kerosene	33,299
Fuel oil	30,327
Grand total, all traffic	71,150

24. During the above 10-year period the commerce on Danvers River consisted almost entirely of inbound shipments of refined petroleum products destined to the two oil companies located on Waters River. These products, which amounted to over 99 per cent of the total tonnage, were received entirely by the Leader Filling Stations Corporation until 1938. In that year, the White Fuel Corporation commenced operations which resulted in the sharp increase in the tonnage shown for 1939. The commerce above Waters River has consisted entirely of small sporadic shipments of lumber to the Calvin Putnam Lumber Company on Porter River, totaling about 400 tons since 1930. Formerly there was a moderate traffic in coal to the Danvers Coal Company which is also located on the Porter River. This traffic, however, gradually decreased from about 4,000 tons in 1917 to 2,000 tons in 1927, after which it entirely disappeared.

25. While there have been some fluctuations in the annual traffic on Danvers River, the general trend has been decidedly upward. The tonnage of petroleum products has shown an increase from about 15,000 tons in 1930 to 71,000 tons in 1939, or roughly 400 per cent during that period. Considering the well established nature of this traffic and the favorable location of Danvers as a distributing center, it is reasonable to assume that the desired channel extending into Waters River would give a further impetus to this trade.

26. Vessel traffic.- Statistics for 1939 show that the movement of petroleum products and a small amount of lumber constituted the traffic of any commercial importance on the Danvers River in that year. Lumber was delivered in 2 small motor vessels drawing about 10 feet and carrying about 75 tons each. Petroleum products were delivered in 127 motor vessels up to 185 feet in length, with drafts of 12 to 14 feet and capacities of about 5,000 barrels. Some of these vessels, it is understood, were not loaded to capacity. The river is also used by an indeterminate number of small fishing boats and pleasure craft, the latter largely for servicing and storage at the boat yard on Waters River which, at present, stores from 50 to 75 boats annually.

27. Difficulties attending navigation.- The principal difficulty attending navigation is that resulting from insufficient depth in the channels. The limited depth available, it is claimed, restricts the period during which loaded barges may navigate the river to a few hours during high tide. This condition, it was said, continually entails expensive delays and prevents the loading of barges to their full capacity, with an attendant increase in the cost of transportation. The presence of shoals, particularly in the vicinity of the mouth of Waters River, results in frequent grounding of loaded vessels. It was stated that 20 oil barges had gone aground in Waters River in the past 10 years, and that on one occasion the cargo had to be pumped into another vessel in order to free it from the flats.

28. Survey.- A topographic, sounding and probing survey of Danvers, Waters, Crane, and Porter Rivers on which to base an estimate of the cost of the desired improvement was completed in September, 1940. The materials encountered were principally mud, sand, clay, and gravel. The accompanying map, marked "Danvers River, Massachusetts", in 2 sheets, scale 1:2400, File No. 4/1-2, F-4-3, shows the latest soundings, probings, and other general features.

29. Plan of improvement.- The plan of improvement considered in this report provides for the dredging of a channel and turning basin as outlined in item a of the desired improvement. While the estimated cost of item b has been determined, subsequent study has shown that the uncertainty of any future use of the channel, or of resulting benefits, does not justify its inclusion in the proposed plan. These items, with estimates of cost, are restated below:

a. A channel 100 feet wide and 12 feet deep at mean low water, extending from deep water at the head of Beverly Harbor to the Water Street Bridge over Waters River, with a turning basin opposite the oil dock at the head of the channel, of the dimensions as shown on the accompanying map.

Excavation 146,000 cu. yds. @ 60¢ per cu. yd. ...	$87,600
Estimated annual maintenance cost	1,500

b. A channel 80 feet wide and 11 feet deep at mean low water, extending from the 12-foot channel opposite the mouth of Waters River upstream to the Liberty Street Bridge over Porter River, with a turning basin at its head, of the dimensions as shown on the accompanying map.

Excavation 201,000 cu. yds. @ 60¢ per cu. yd. ... $120,600

Estimated annual maintenance cost 2,000

30. In addition to the cost of dredging item b, there would be the expense of lowering the 24-inch outfall sewer which crosses the Porter River at its mouth. Where it crosses the channel, the top of the pipe is 12.5 feet below mean low water, or 1.5 feet below the desired depth. The cost of lowering this structure, which would be borne by the South Essex Sewerage District, has been estimated by its engineer at $16,000.

31. The above estimates for dredging include engineering and contingency costs. Quantities are in terms of place measurement with an allowance of one foot for overdepth. The unit price is based on the work being done by contract and disposal of the dredged material at sea.

32. Aids to navigation.- The Coast Guard concurs as to the location of the desired channel extending into Waters River, and has stated that its consummation would involve no expenditure by that service.

33. Analysis of economic justification.- The economic life of the desired improvement, as outlined in item a, paragraph 21 above, is estimated at 40 years, and the economic cost as an annual carrying charge has been computed on that basis. An analysis of the cost is given below:

a. Federal investment:

(1) Estimated cost of improvement	$87,600
Local cooperation (1/3 of initial cost)	29,200
Engineer Department first cost	58,400
(2) Estimated expenditures by other Federal Departments	-0-
(3) Total Federal investment	58,400

b. Federal annual carrying charge:

(1) Interest at 3% on item a(3)	$ 1,752
(2) Amortization of item a(3) (40 years @ 3%)	774
(3) Estimated annual maintenance cost	1,500
(4) Total Federal annual carrying charge	4,026

c. Non-Federal investment:

(1) Local cooperation (see item a(1) above)	29,200
(2) Total non-Federal investment	29,200

d. Non-Federal annual carrying charge:

(1) Interest at 4% on item c(2)	1,168
(2) Amortization of item c(2) (40 years @ 4%)	307
(3) Total non-Federal annual carrying charge	1,475

e. Total annual carrying charge:

(1) Federal annual carrying charge	4,026
(2) Non-Federal annual carrying charge	1,475
(3) Total annual carrying charge	5,501

34. The primary object of an improved channel extending into Waters River is to eliminate transportation delays and to permit the loading to capacity of the barges which make deliveries to the Leader Filling Stations Corporation and the White Fuel Corporation located at the head of this channel. Recently, these companies advised this office that the improvement would effect a saving in transportation costs of $6,125 on their present annual business of 71,000 tons, or about 8.6 cents per ton. While it is possible that this saving would be very largely passed on to the consumer, there is no doubt that a fair proportion of the resulting benefits would accrue directly to these companies. It appears, therefore, that the benefits to be derived would warrant the Federal annual carrying charge of $4,026, and that the United States would be justified in undertaking this improvement, provided local interests contribute one-third of the initial cost and meet other conditions of cooperation hereinafter stated.

35. Discussion and conclusions.- The town of Danvers is located in

one of the most populous and highly industrialized sections of Massachusetts, about 28 miles by water northeast of the city of Boston. Its present waterborne commerce consists almost entirely of petroleum products which are received for distribution to local dealers and to communities within a radius of 250 miles. The terminal facilities for handling these products are those of the two oil companies located on Waters River at the head of the desired 12-foot channel.

36. Formerly there was a moderate traffic on the Danvers River which consisted of coal and lumber, but this commerce gradually dwindled to about 2,000 tons of coal in 1927, and after that year disappeared entirely. The traffic in petroleum products dates from the establishment of terminal facilities by the Leader Filling Stations Corporation. In 1930, this traffic amounted to about 15,000 tons, and since that year has averaged about 40,000 tons annually. In 1938, the White Fuel Corporation established storage facilities at the same location, and at the present time these companies are receiving petroleum products at a rate slightly in excess of 70,000 tons annually. This business is handled in small motor barges of about 5,000-barrel capacity, with drafts from 12 to 14 feet. The draft of these vessels is too great for economical operation due to the existing depth in the channel. If the desired depth of 12 feet is provided, the oil companies contemplate, in addition to the saving in transportation costs already shown, a substantial expansion in their operations. The Leader Filling Stations Corporation estimates an increase of 100 per cent in its business within the next four years, with a proportionate saving in transportation costs. While this estimate appears rather optimistic, the growth of the oil traffic in the past 10 years indicates that a substantial increase in the future may be expected.

37. There is no commerce on the Danvers River above the mouth of Waters River, except an occasional shipment of lumber to the Calvin Putnam Lumber Company located on Porter River. During the past 10 years these shipments have amounted to approximately 400 tons. This company and the

Danvers Coal Company, also located on Porter River, anticipate a revival of the coal and lumber traffic if this section of the channel were improved. This statement, however, is largely conjectural as no assurance has been given as to the amount of this business, or the extent of the benefits to be expected. While it is claimed that some of the major oil companies have considered the erection of bulk storage facilities on this reach of the river, but abandoned the idea because of a lack of depth in the channel, there is no present indication that such facilities would be established. It is not believed, therefore, that an expenditure by the United States for the improvement of this section of the channel would be justified on the basis of such uncertain prospective uses.

38. The possibility of any commercial development of Danvers River between its mouth at the head of Beverly Harbor and the mouth of Waters River is regarded as extremely remote. More than one-half of this reach of the river, its lower half, has a natural channel of navigable width with a controlling depth of 12 feet at mean low water, except through the draw passage of the railroad bridge where the depth is 10.3 feet. In spite of this fact, no commercial developments have taken place along this section of the river. This is probably due, in part, to certain physical characteristics of the locality which do not lend themselves to an economical development of the unimproved shore frontage. The channel in this section lies for the most part between wide flats, and much of the shore on both sides is rocky. The north shore is developed for park and residential uses, while the south shore is bordered by the Kernwood Country Club and unimproved land with a shore frontage of approximately three-quarters of a mile. The rail connections nearest to this reach of the river are located at Beverly and at the head of the desired improvement in Waters River.

39. Efficient distribution of petroleum products in the highly developed region of which Danvers is a part requires not only adequate primary distributing centers like Boston and Portland, but also suitably located secondary distributing centers to which these products may be trans-shipped in

smaller vessels and distributed inland by rail and truck. Danvers, in the face of somewhat adverse conditions in the channel leading to the oil companies on Waters River, has demonstrated its ability to fulfill this phase of the distribution system, but further expansion probably cannot be fully realized unless a greater depth of channel is provided.

40. The improvement considered would provide for this further expansion, but would, it is believed, because of the improbability of commercial development along the lower reach of the Danvers River, admit only of the expansion of the two oil facilities now located on Waters River, whose vessels handle over 99 per cent of the total commerce on Danvers River. Provision of the 12-foot channel to the wharf used by the two oil companies would apparently permit substantial savings to these companies in the cost of transportation of petroleum products.

41. The district engineer is of the opinion that the improvement of Danvers River as outlined in item a, paragraph 29 above, would adequately meet the present or any reasonably prospective needs of commerce. He believes, however, that the resulting benefits would not be sufficiently general in character to justify the United States in undertaking the improvement wholly at Federal expense, and that the local benefits from the improvement would be sufficiently great to warrant the requirement that local interests contribute one-third of the initial cost and, in addition, dredge a berth 50 feet wide and at least 12 feet deep at mean low water alongside the existing oil terminal on Waters River.

42. The district engineer concludes that, due to the failure of local interests to give any assurance of a contribution toward the initial cost of the improvement, other than the expressed willingness of the Division of Waterways of the Commonwealth of Massachusetts to support legislation by the state to contribute one-half of the sum required as local cooperation, the United States would not be warranted in undertaking the improvement at the present time.

43. Recommendation.- The district engineer recommends that no project

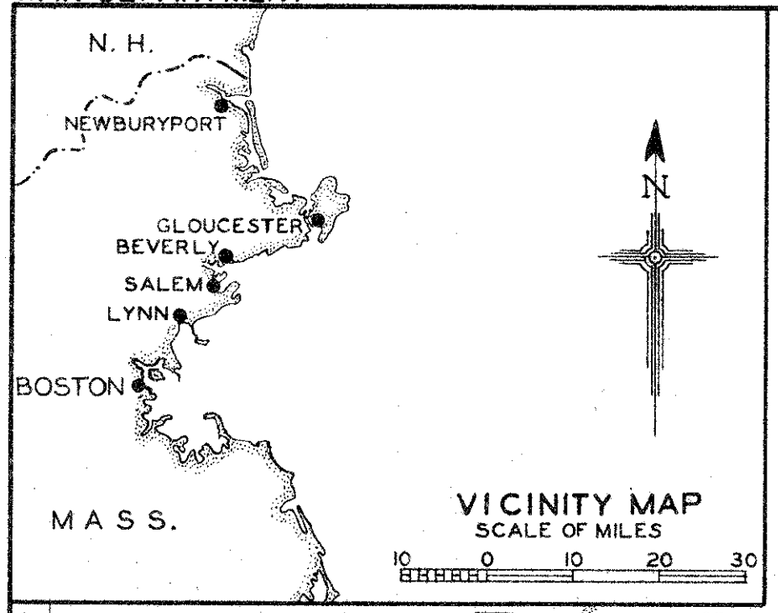
for the improvement of Danvers River, Massachusetts, be adopted by the United States at the present time.

L. B. Gallagher
Lieut. Col., Corps of Engineers
District Engineer

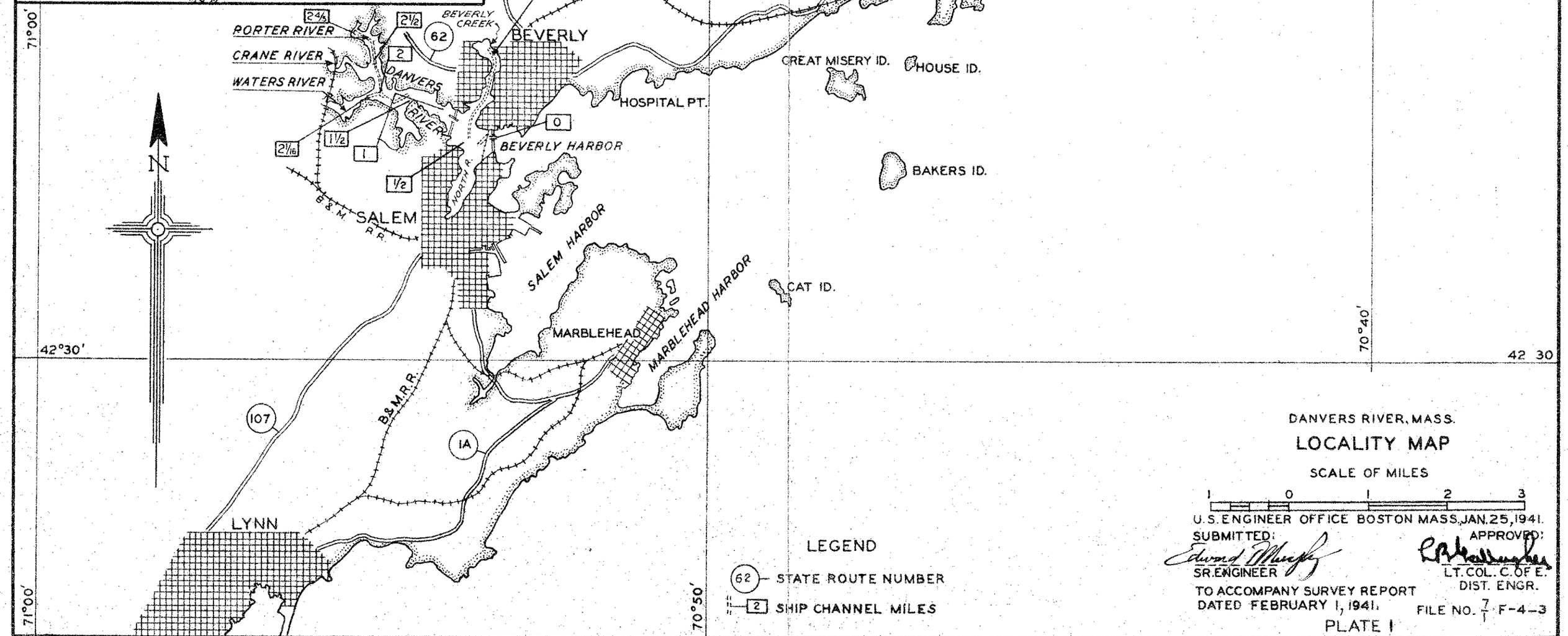
Inclosures:
Map (in 2 sheets)
Plates 1, 2 & 3

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



DREDGED BY COMMONWEALTH OF MASSACHUSETTS.



LEGEND

(62) — STATE ROUTE NUMBER

2 SHIP CHANNEL MILES

DANVERS RIVER, MASS.

LOCALITY MAP

SCALE OF MILES

1 0 1 2 3

U.S. ENGINEER OFFICE BOSTON MASS. JAN. 25, 1941.

SUBMITTED: Edward Murphy, SR. ENGINEER

APPROVED: [signature], LT. COL. C. OF E. DIST. ENGR.

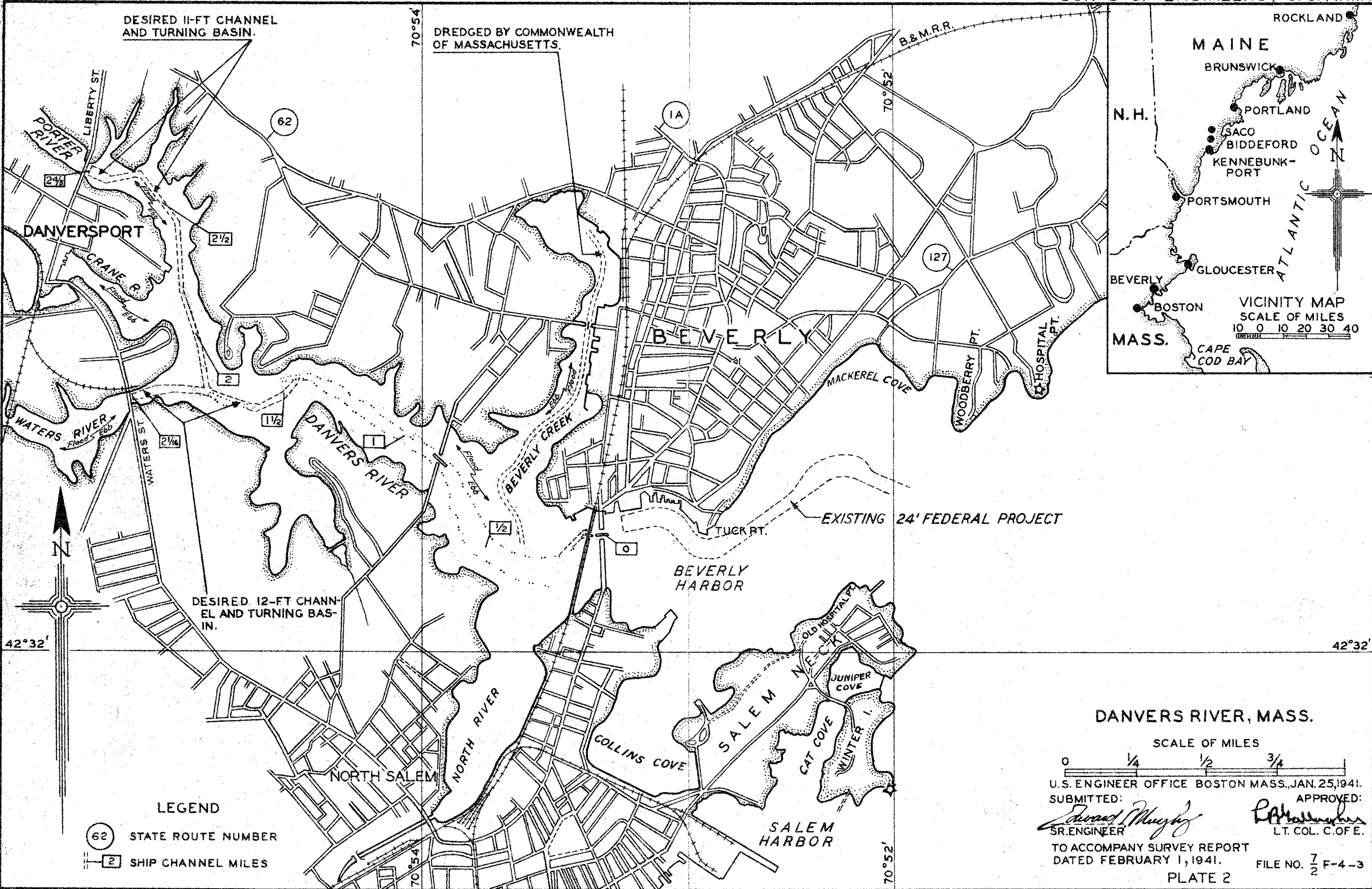
TO ACCOMPANY SURVEY REPORT DATED FEBRUARY 1, 1941.

FILE NO. 7/1 F-4-3

PLATE I

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY


DESIRED 11-FT CHANNEL AND TURNING BASIN.
DREDGED BY COMMONWEALTH OF MASSACHUSETTS.
70°54'
70°52'
42°32'
B.&M.R.R.
62
1A
127
PORTER RIVER
LIBERTY ST.
DANVERSPORT
CRANE R.
WATERS RIVER
WATERS ST.
DANVERS RIVER
BEVERLY CREEK
BEVERLY
MACKEREL COVE
WOODBERRY PT.
HOSPITAL PT.
TUCK PT.
EXISTING 24' FEDERAL PROJECT
BEVERLY HARBOR
DESIRED 12-FT CHANNEL AND TURNING BASIN.
NORTH SALEM
NORTH RIVER
COLLINS COVE
SALEM NECK
OLD HOSPITAL PT.
JUNIPER COVE
CAT COVE
WINTER I.
SALEM HARBOR
2 4/5
2 1/2
2
1 1/2
2 1/16
1
1/2
0
Flood
Ebb
N
MAINE
N.H.
MASS.
ROCKLAND
BRUNSWICK
PORTLAND
SACO
BIDDEFORD
KENNEBUNK-PORT
PORTSMOUTH
GLOUCESTER
BEVERLY
BOSTON
CAPE COD BAY
ATLANTIC OCEAN
VICINITY MAP
SCALE OF MILES
10 0 10 20 30 40
LEGEND
62 STATE ROUTE NUMBER
2 SHIP CHANNEL MILES

DANVERS RIVER, MASS.

SCALE OF MILES

0 1/4 1/2 3/4 1

U.S. ENGINEER OFFICE BOSTON MASS., JAN. 25, 1941.

SUBMITTED: Edward L. Murphy, SR. ENGINEER

APPROVED: [signature] LT. COL. C. OF E.

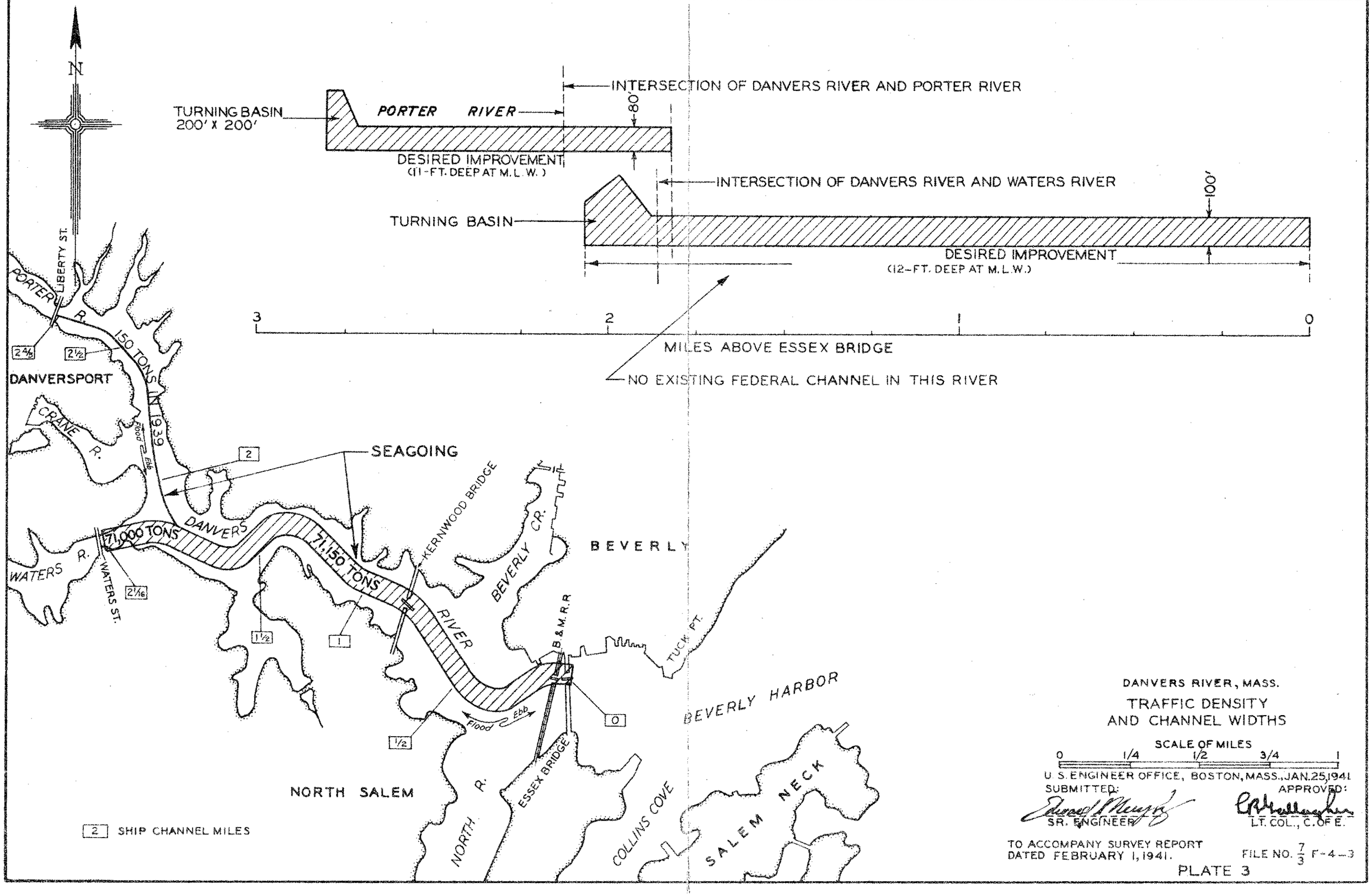
TO ACCOMPANY SURVEY REPORT DATED FEBRUARY 1, 1941.

FILE NO. 7/2 F-4-3

PLATE 2

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



DANVERS RIVER, MASS.

TRAFFIC DENSITY
AND CHANNEL WIDTHS

SCALE OF MILES

0 1/4 1/2 3/4 1

U. S. ENGINEER OFFICE, BOSTON, MASS., JAN. 25, 1941

SUBMITTED: Edward J. Murphy
SR. ENGINEER

APPROVED: C. P. Gallagher
LT. COL., C. OF E.

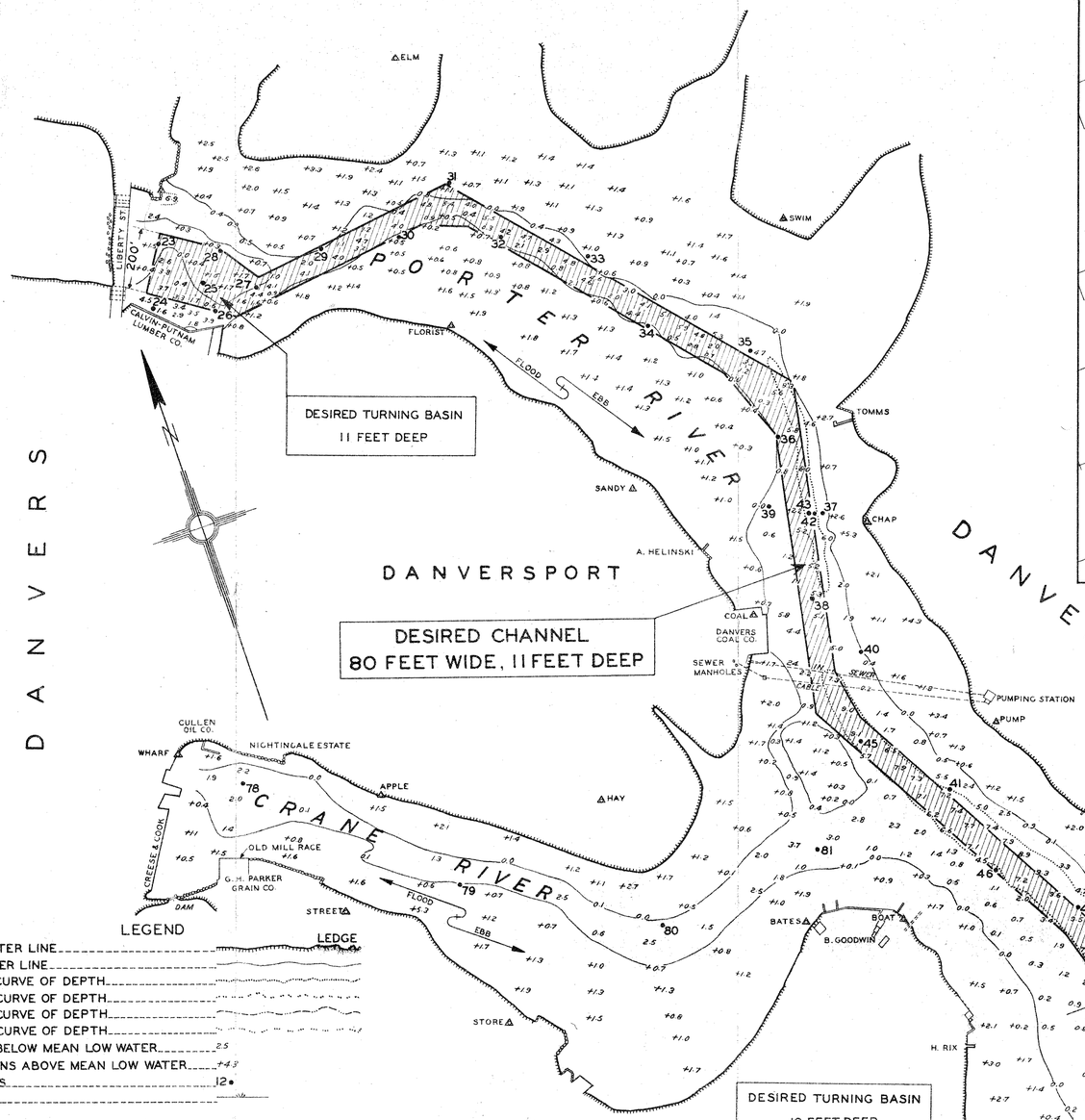
TO ACCOMPANY SURVEY REPORT
DATED FEBRUARY 1, 1941.

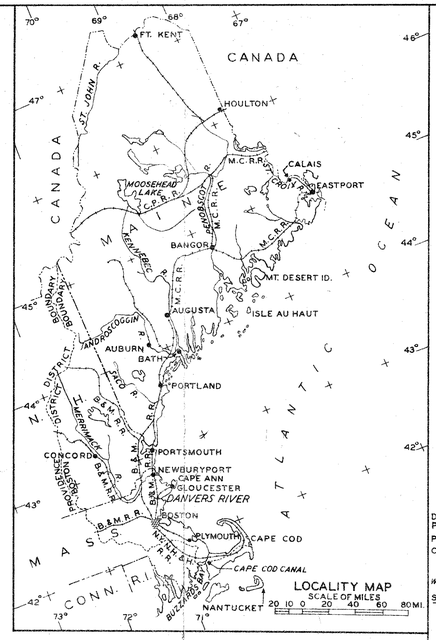
FILE NO. 7/3 F-4-3

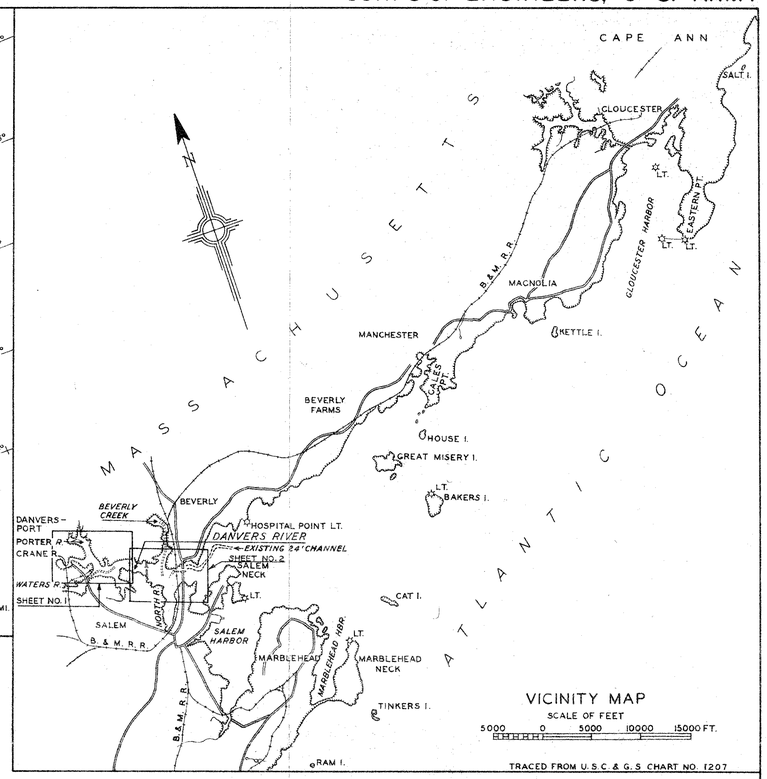
PLATE 3

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY







DESIRED CHANNEL
100 FEET WIDE, 12 FEET DEEP

DESIRED TURNING BASIN
12 FEET DEEP

BEVERLY

SALEM

LEGEND

HIGH WATER LINE	
LOW WATER LINE	
6-FOOT CURVE OF DEPTH	
12-FOOT CURVE OF DEPTH	
15-FOOT CURVE OF DEPTH	
18-FOOT CURVE OF DEPTH	
DEPTHS BELOW MEAN LOW WATER	2.5
ELEVATIONS ABOVE MEAN LOW WATER	+4.3
PROBINGS	12•
MARSH	
LEDGE	

PROBINGS

NO. OF PROBING	DEPTH IN FEET WATER	DEPTH IN FEET PROBING	PENE-TRATION	CHARACTER OF MATERIAL
16	13.6	20.3	6.7	MUD
17	10.6	19.5	8.9	MUD
18	13.0	20.0	7.0	MUD
19	7.8	17.5	9.7	SAND TO MUD
20	8.8	17.9	9.1	MUD TO SAND TO MUD
21	9.1	17.5	8.4	MUD TO SAND TO COARSE SAND
22	5.2	17.3	12.1	MUD AND SAND
23	+1.5	13.1	14.6	MUD TO SAND
24	2.8	13.1	10.3	GRAVEL TO MUD TO SAND
25	+0.4	13.0	13.4	MUD AND MUD WITH SAND
26	3.3	13.9	10.6	MUD AND CLAY
27	4.5	13.2	8.7	MUD AND CLAY
28	+1.0	13.5	14.5	MUD AND CLAY
29	+0.3	13.5	13.8	MUD
30	+0.4	13.2	13.6	MUD AND CLAY
31	+1.1	13.2	14.3	MUD
32	1.0	14.3	13.3	MUD AND CLAY
33	0.9	13.3	12.4	MUD AND STIFF CLAY
34	2.2	13.1	10.9	MUD TO SAND
35	4.2	13.2	9.0	MUD TO CLAY
36	+0.3	13.1	13.4	MUD TO CLAY
37	4.9	11.7	6.8	MUD TO HARD GRAVEL AND REFUSAL
38	4.4	13.1	8.7	MUD TO SAND AT GRADE
39	0.1	13.1	13.0	MUD AND SANDY CLAY
40	1.7	13.5	11.8	MUD AND SANDY CLAY
41	5.0	13.1	8.1	MUD ON TOP TO GRAVEL
42	6.7	9.1	2.4	GRAVEL TO BOULDER
43	6.5	13.4	6.9	GRAVEL, SHALE TO CLAY
44	—	—	—	NO PROBING
45	7.7	13.4	5.7	MUD AND SAND
46	6.9	13.5	6.6	MUD-CLAY AND SAND
47	6.3	14.1	7.8	MUD TO SAND
48	5.2	13.2	8.0	MUD AND CLAY
49	7.5	17.0	9.5	MUD
50	1.5	17.1	15.6	MUD AND SOFT CLAY
51	5.6	17.3	11.7	MUD
52	+1.3	17.4	18.7	SOFT MUD
53	+0.1	17.1	17.2	MUD, CLAY, MUD
54	+1.6	17.1	18.7	GRAVEL TO CLAY (HARD DRIVING)
55	+2.0	17.2	19.2	MUD
56	6.0	17.1	11.1	MUD
57	7.5	17.1	9.6	ALL STIFF CLAY
58	7.1	17.2	10.1	CLAY
59	10.2	17.0	6.8	MUD TO CLAY
60	10.0	18.1	8.1	MUD TO CLAY
61	11.9	17.1	5.2	MUD
62	11.4	18.6	7.2	MUD TO CLAY
63	5.8	17.0	11.2	MUD AND SAND TO CLAY
64	7.8	17.4	9.6	MUD
65	9.3	17.1	7.8	MUD AND SANDY YELLOW CLAY
66	13.6	17.1	3.5	MUD TO LOOSE SAND
77	+1.4	17.2	18.6	MUD
78	2.1	8.2	6.1	MUD AND SANDY CLAY TO STIFF CLAY
79	+0.6	9.7	10.3	MUD TO SANDY CLAY
80	0.9	8.2	7.3	SANDY CLAY TO SAND
81	2.8	8.2	5.4	MUD AND SANDY CLAY

NOTE

SURVEYED BY E. C. FARWELL, SURVEYMAN, FROM JUNE 25, 1940 TO SEPT. 27, 1940 AND N. DRUCKER, SURVEYMAN, FROM NOV. 20, 1940 TO NOV. 27, 1940.

DEPTHS ARE EXPRESSED IN FEET AND TENTHS AND ARE REFERRED TO THE PLANE OF MEAN LOW WATER AS INDICATED BY THE BENCH MARK.

BENCH MARK: A STANDARD U. S. C. & G. S. DISK STAMPED "5 1936," SET IN THE TOP OF A CONCRETE RETAINING WALL ON THE EAST SIDE OF CABOT ST., AND THE NORTHEAST CORNER OF THE ESSEX BRIDGE.

ELEVATION: 19.68 FEET ABOVE MEAN LOW WATER.

DANVERS RIVER, MASSACHUSETTS

IN 2 SHEETS SHEET NO. 1 SCALE 1:2400

100 0 100 200 300 400 500 600 700 800 900 1000 FT.

U. S. ENGINEER OFFICE, BOSTON, MASS., JAN. 25, 1941

SUBMITTED: Edward T. Murphy, SR. ENGINEER

APPROVED: R. A. Wadsworth, LT. COL., CORPS OF ENGINEERS, DISTRICT ENGINEER

TO ACCOMPANY SURVEY REPORT DATED FEBRUARY 1, 1941.

DES. BY
DR. BY C.A.G.
TR. BY J.M.T.
CK. BY F.N.S.

FILE NO. 4/1 F-4-3

DANVERS RIVER, MASSACHUSETTS

IN 2 SHEETS SHEET NO. 2 SCALE 1: 2400

100 0 100 200 300 400 500 600 700 800 900 1000 FT.

U. S. ENGINEER OFFICE, BOSTON, MASS., JAN. 25, 1941.

SUBMITTED: Edward F. Murphy, SR. ENGINEER

APPROVED: [signature], LT. COL., CORPS OF ENGINEERS

TO ACCOMPANY SURVEY REPORT DATED FEBRUARY 1, 1941

DES. BY
DR. BY C.A.G.
TR. BY J.M.T.
CK. BY F.N.S.

FILE NO. 4/2 F-4-3

MATCH THIS LINE WITH BORDER LINE OF SHEET NO. 1

BEVERLY

SALTERS POINT

DANVERS RIVER

SALEM

BEVERLY HARBOR

TUCKS POINT

F. F. WHIPPLE

PARK

ROBERT ROBINSON

WOOD PLATFORM

WOOD BULKHEAD

CURB

KERNWOOD BRIDGE

KERN

FLOOD

EBB

GOLF

BEVERLY CREEK

PLEASANT VIEW BATHING BEACH

H. ANDERSON

STEPS

DREDGED TO 9-FT. AT M.L.W. BY COMMONWEALTH OF MASSACHUSETTS.

NO. SHORE LOBSTER CO.

STUART

METAL HYDRIDES CO.

CABOT ST.

JOHN GIRDLER COAL CO.

TOWN LANDING

NEW ENGLAND COAL & COKE CO.

MANHOLE

RAIL

ESSEX

BENCH MARK

FOSTER WHARF

SALEM WATER WORKS

GULF OIL CORP.

JOHN GIRDLER COAL CO.

GULF OIL CORP

GULF OIL CORP.

EXISTING 24-FT. CHANNEL

LOBSTER ROCKS

BOSTON & MAINE R.R. BRIDGE

CABLE

20 IN. WATER MAIN

16 IN. GAS PIPE

BRIDGE

MH

STROM

ANGUS CARLSON

CONRAD

WELCH & CO.

SALEM GAS CO.

GEORGE P. JEWETT ESTATE

POINT

NO. SHORE HOSPITAL

NORTH RIVER

STREET

SOUNDINGS DOWNSTREAM FROM ESSEX BRIDGE WERE TAKEN IN JULY AND AUGUST, 1938.

PROBINGS

NO. OF PROBING	DEPTH IN FEET WATER	DEPTH IN FEET PROBING	PENE-TRATION	CHARACTER OF MATERIAL
1	13.8	17.7	3.9	MUD AND CLAY
2	18.4	20.8	2.4	GRAVEL
3	13.4	18.0	4.6	SAND TO MUD
4	14.3	17.7	3.4	SAND
5	13.5	17.1	3.6	HARD SAND
6	14.6	18.2	3.6	HARD SAND
7	16.6	19.9	3.3	MUD, SHELLS AND SAND
8	11.9	18.9	7.0	MUD AND SAND
9	12.8	17.1	4.3	MUD AND HARD SAND
10	11.6	17.4	5.8	MUD
11	11.0	17.0	6.0	MUD AND SAND
12	13.4	19.8	6.4	MUD TO SAND
13	14.7	18.6	3.9	MUD AND SAND
14	12.0	19.6	7.6	MUD TO SAND TO MUD
15	13.5	19.7	6.2	MUD AND SAND
67	10.6	17.4	6.8	MUD, SAND TO GRAVEL TO CLAY
68	4.3	17.0	12.7	MUD AND SANDY CLAY
69	1.3	14.1	12.8	MUD TO GRAVEL TO LEDGE
70	2.2	15.2	13.0	MUD TO GRAVEL TO LEDGE
71	2.2	17.0	14.8	GRAVEL ON TOP TO MUD TO LEDGE
72	2.2	17.1	14.9	MUD TO CLAY
73	3.0	17.2	14.2	MUD TO SANDY CLAY
74	9.3	17.0	7.7	MUD, SAND
75	12.9	17.1	4.2	MUD TO SAND
76	9.0	17.9	8.9	MUD TO SAND TO GRAVEL TO SOFT MATERIAL
82	4.9	17.4	12.5	MUD AND SANDY CLAY
83	3.0	17.7	14.7	MUD, GRAVEL TO LEDGE
84	16.0	17.9	1.9	MUD
85	9.2	19.0	9.8	MUD AND CLAM SHELLS
86	9.0	18.7	9.7	MUD AND CLAM SHELLS
87	14.5	20.0	5.5	MUD